Sept. 28, 1943. G. W. LOVELY 2,330,437

MINING APPARATUS

Filed July 9, 1941 7 Sheets-Sheet 1

Fig. 1.

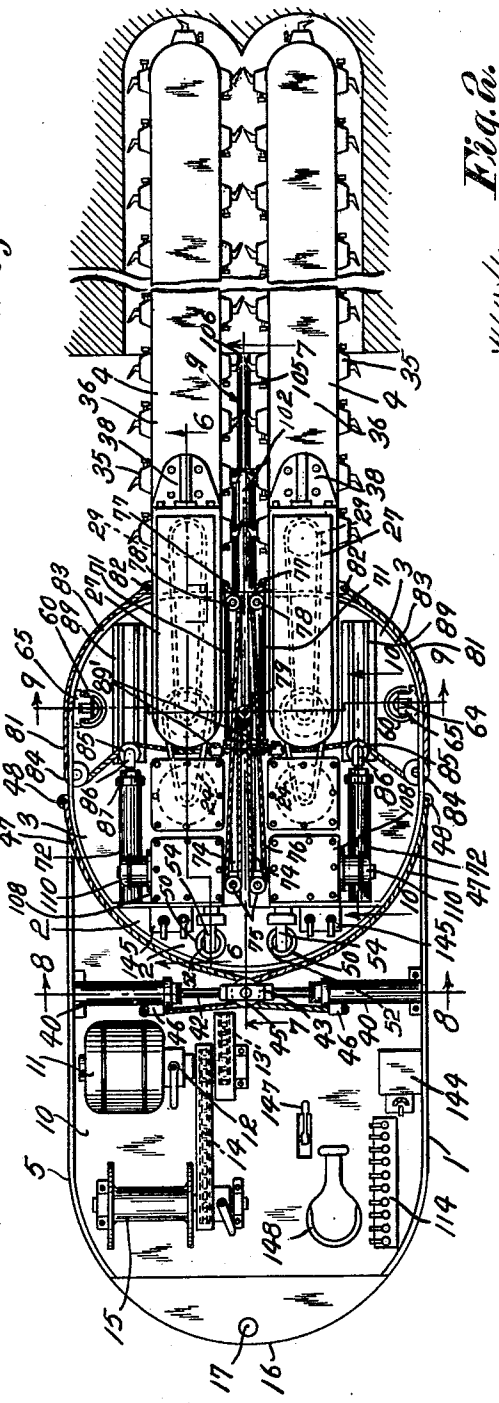
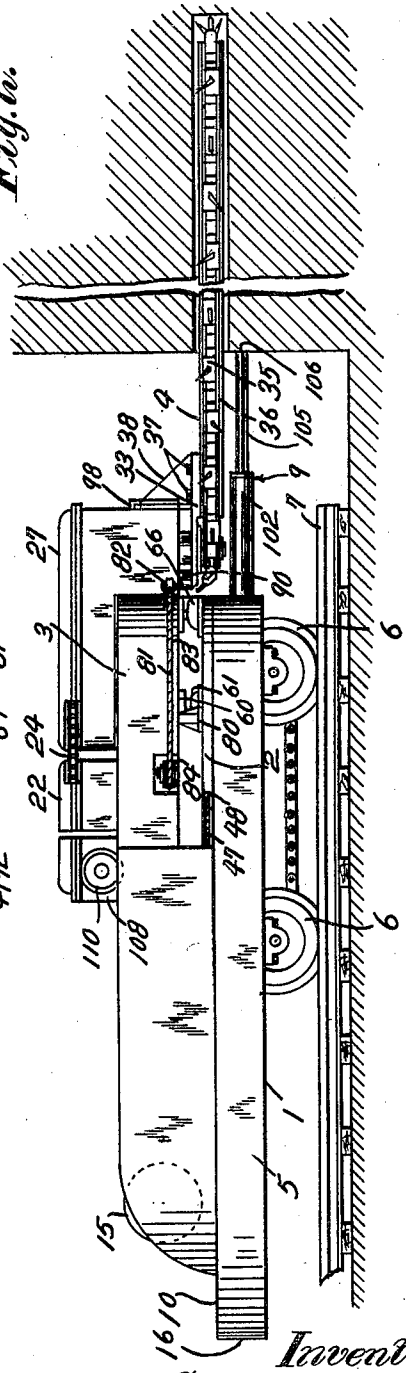


Fig. 2.



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MINING APPARATUS

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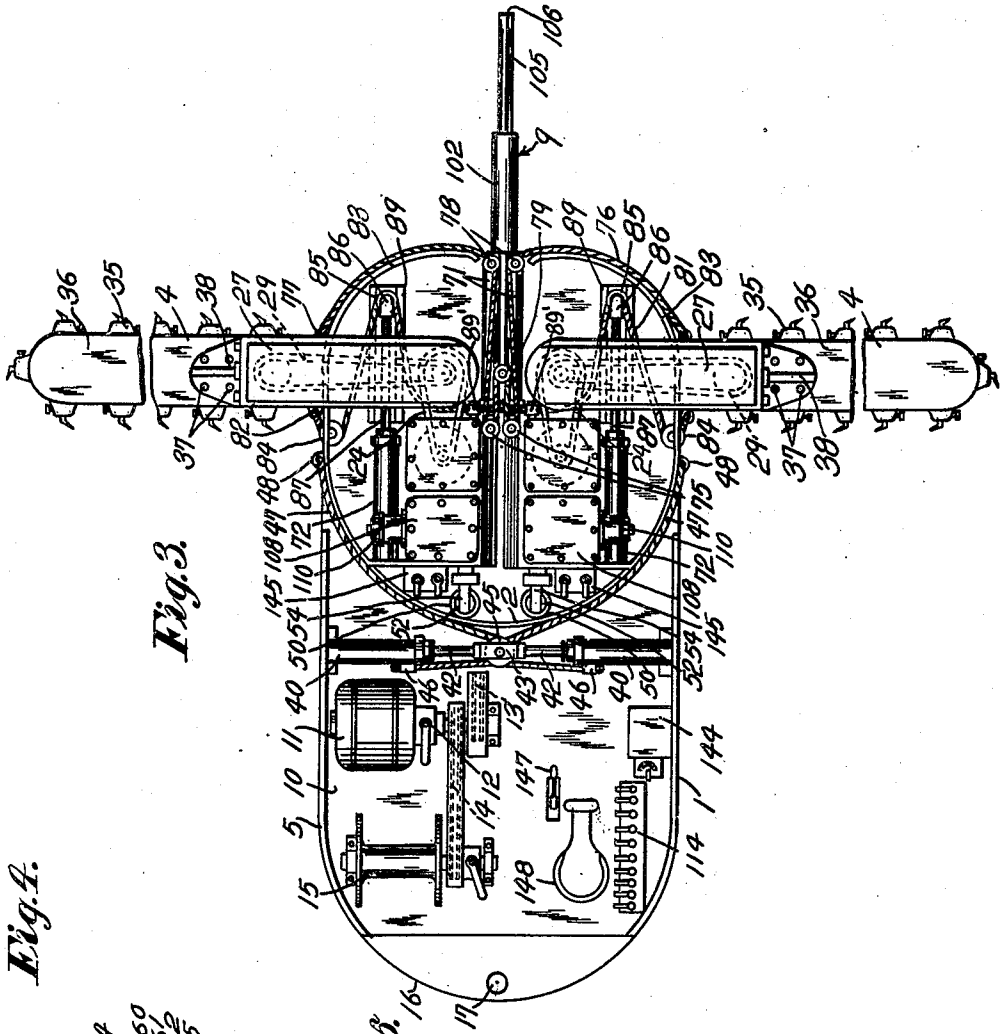


Fig. 3.

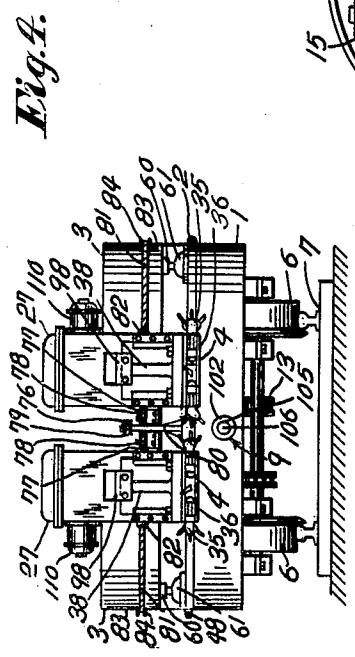


Fig. 4.

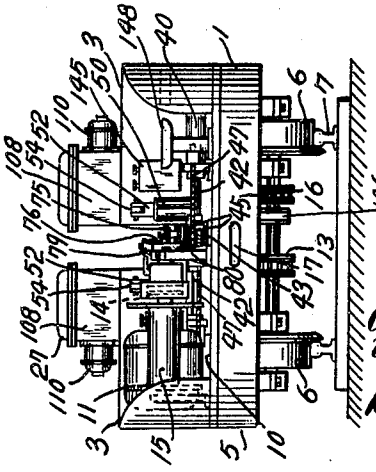


Fig. 5.

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MINING APPARATUS

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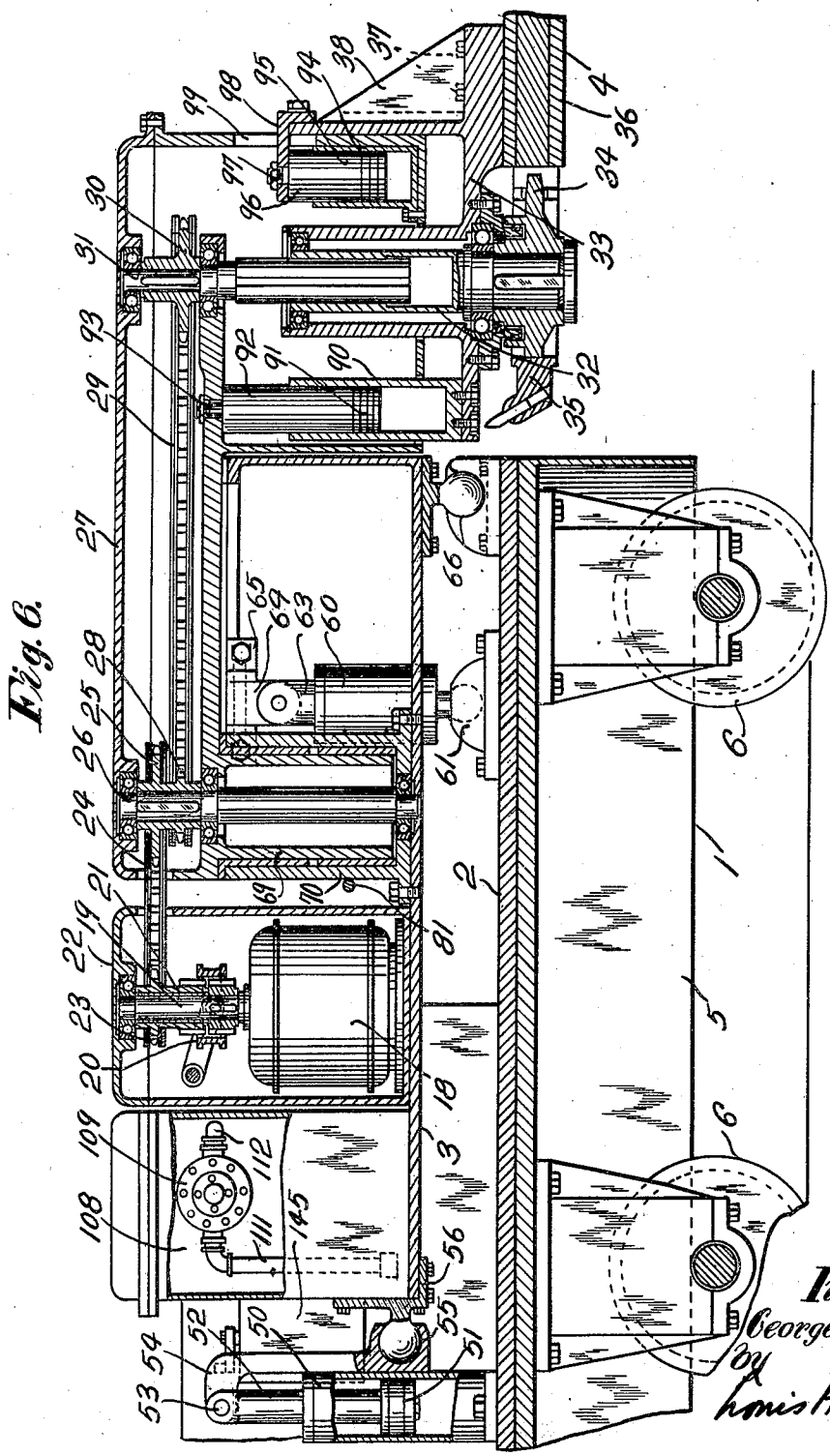


Fig. 6.

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MINING APPARATUS

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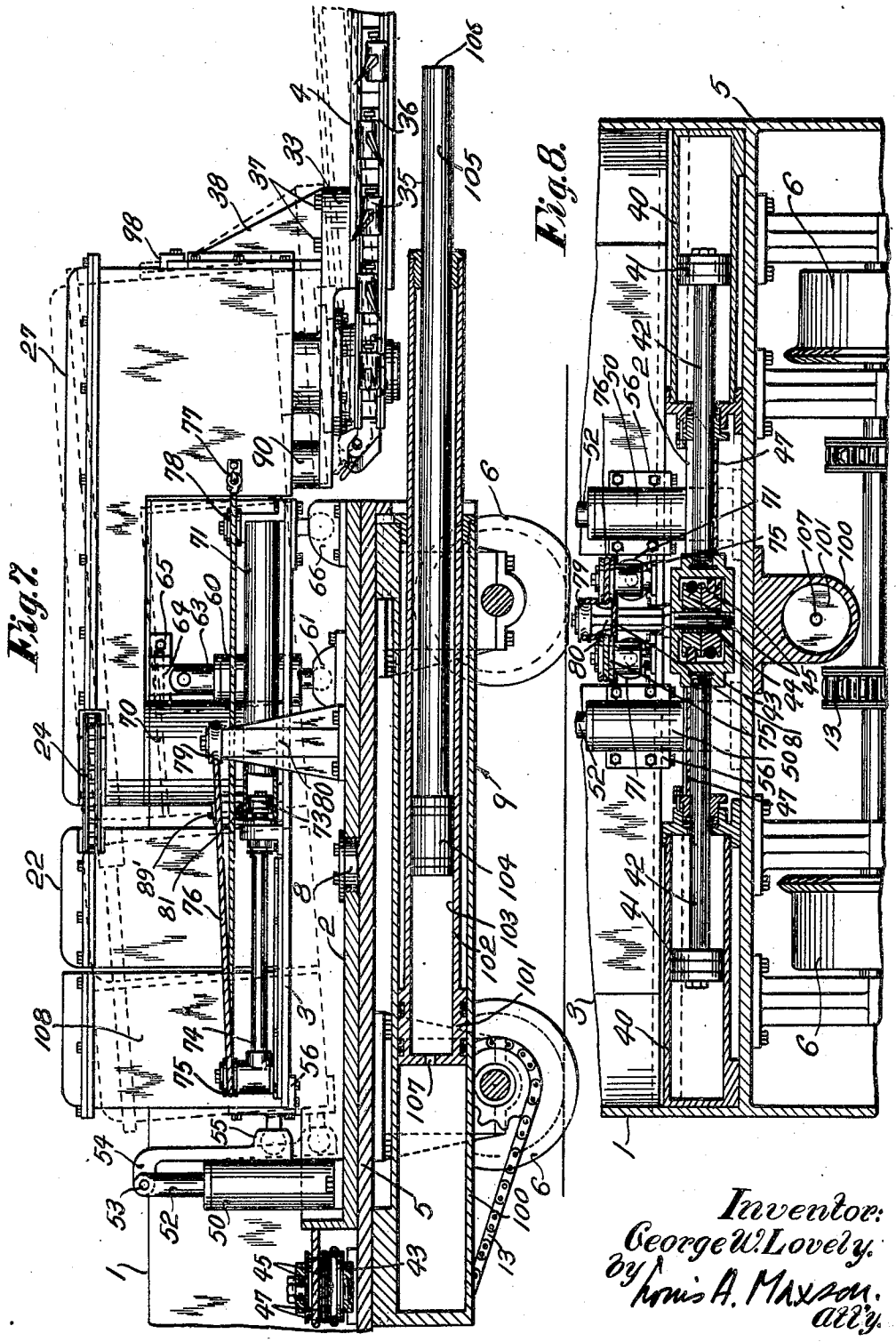


Fig. 7.

Fig. 8.

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MINING APPARATUS

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Fig. 9.

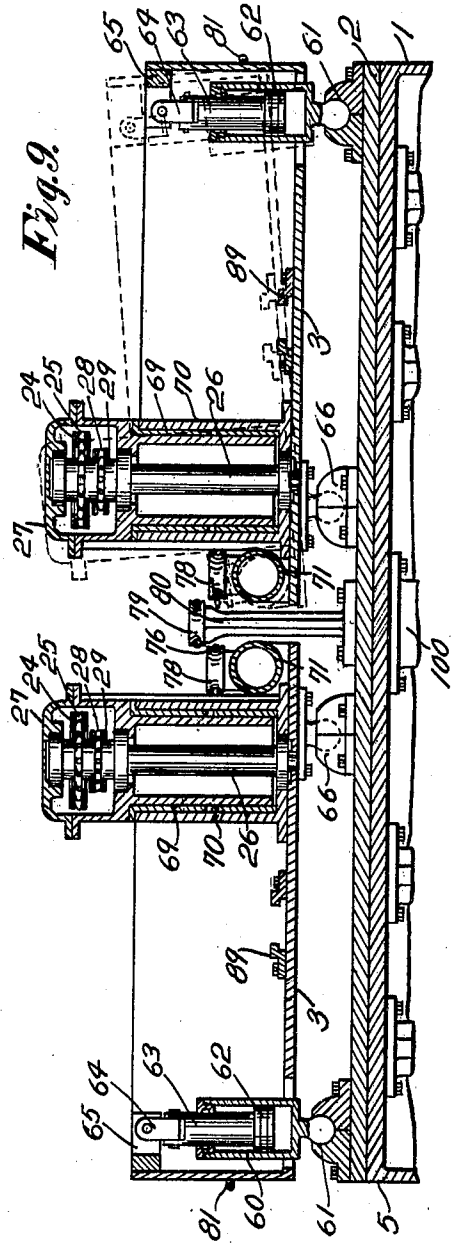
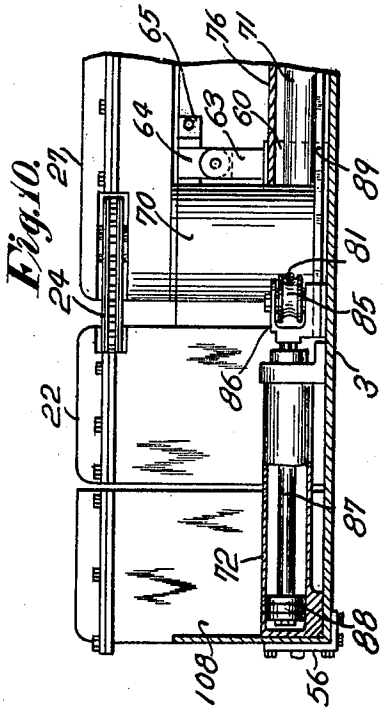


Fig. 10.



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MINING APPARATUS

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Fig. 11.

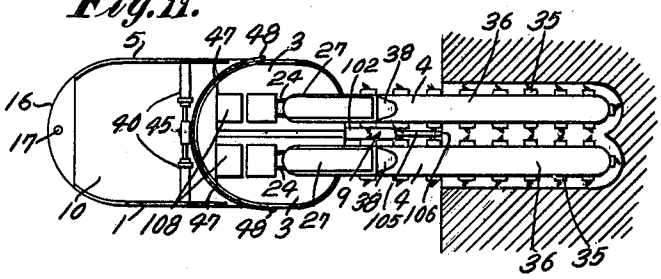


Fig. 12.

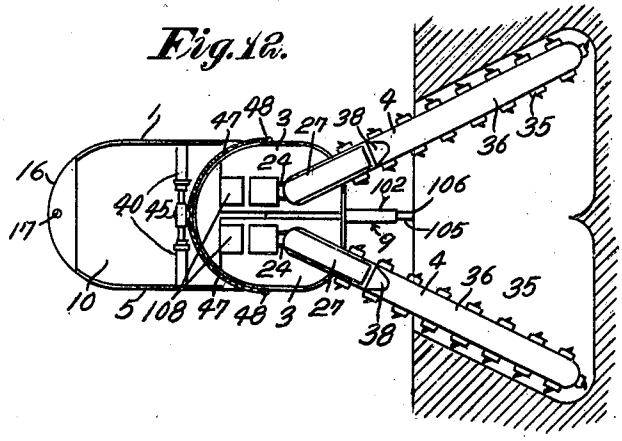


Fig. 13.

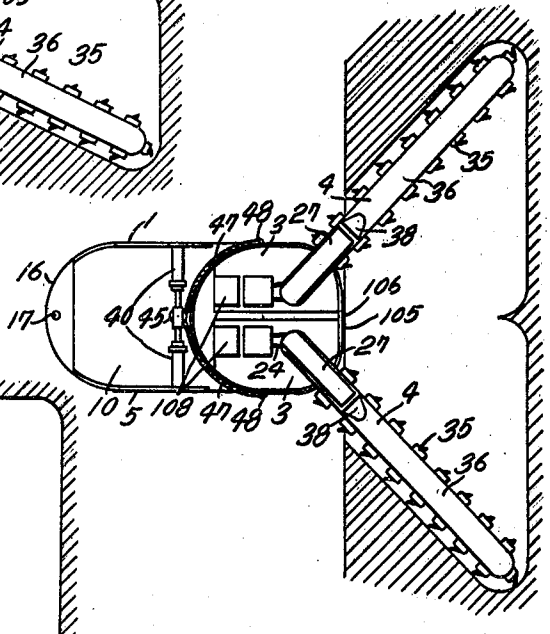
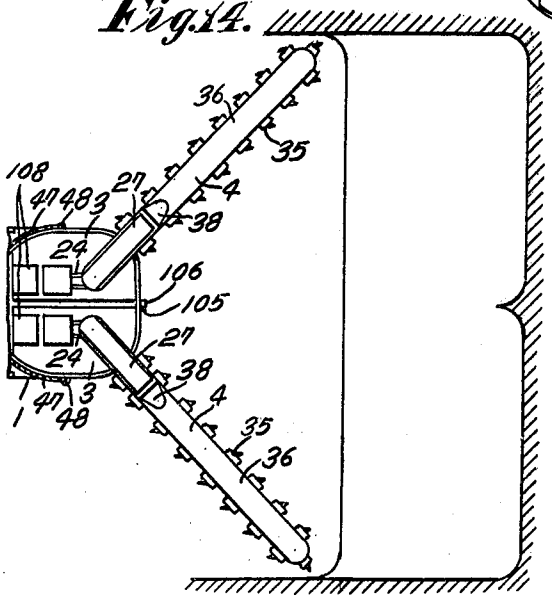


Fig. 14.



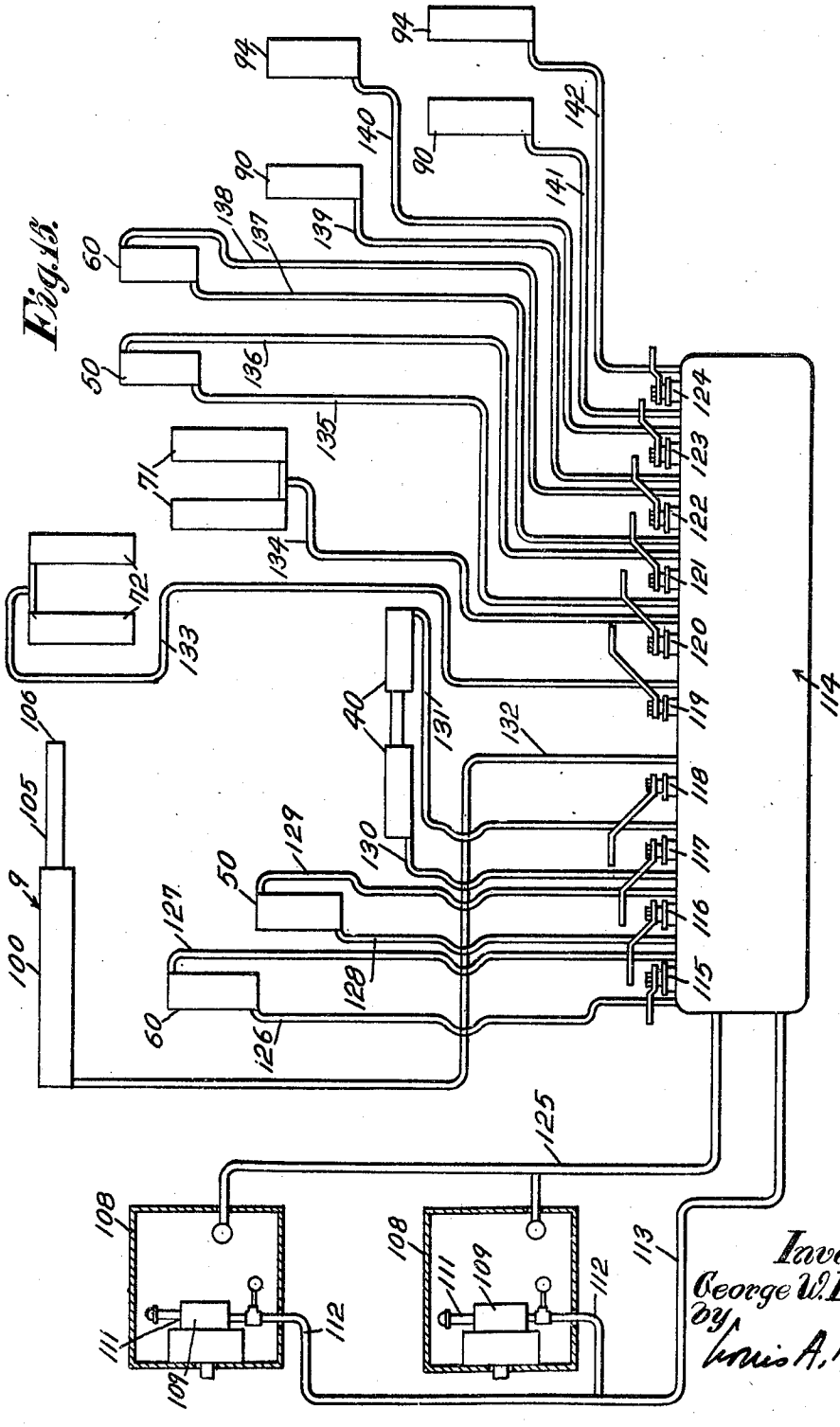
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MINING APPARATUS

Filed July 9, 1941 7 Sheets-Sheet 7

Fig. 13.



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UNITED STATES PATENT OFFICE

2,330,437

MINING APPARATUS

George W. Lovely, Auburn, Ill., assignor to Sullivan Machinery Company, a corporation of Massachusetts

Application July 9, 1941, Serial No. 401,691

26 Claims. (Cl. 262—29)

This invention relates to mining apparatus, and more particularly to improvements in kerf cutting apparatus for cutting plane kerfs in a coal seam of a coal mine.

An object of the present invention is to provide an improved coal mining apparatus. Another object is to provide an improved kerf cutting apparatus having novel and improved means for cutting plane kerfs in a coal seam of a coal mine. Yet another object is to provide an improved kerf cutting means for a kerf cutting apparatus whereby kerfs may be cut in a coal seam in an improved manner, and having associated therewith improved adjustable supporting means whereby the kerf cutting means may be adjusted to cut plane kerfs in the coal seam at different elevations. A further object is to provide novel means for controlling the feeding movement of the kerf cutting means and for supporting and adjusting the kerf cutting means. A still further object is to provide an improved coal mining apparatus of the dual-kerf-cutter type, having novel means for supporting, actuating and adjusting the kerf cutters. Another object is to provide an improved coal mining apparatus of the dual-cutter-bar, straight-face type which is extremely compact, well balanced and rugged in design, and which is also comparatively simple in construction. Still another object is to provide a novel tiltable turntable structure for the kerf cutting means. A further object is to provide an improved coal cutting apparatus having improved fluid operated means for adjusting the kerf cutting means. Another object is to provide an extremely efficient and practical coal cutting apparatus which is cheap and simple in construction. A still further object is to provide a novel coal cutting apparatus of the dual-bar truck mounted, track guided type with the cutter bars so arranged that the cutting strains on one bar will be substantially balanced by those of the other bar, and so constructed that the cutters of the cutter bars during swinging of the latter serve to aid the truck propelling means in the feeding of the apparatus toward the work, thereby substantially to reduce the strains on the trackway. Still another object is to provide an improved fluid actuated controlling means for controlling the feeding movement of the cutting means during a straight-face cutting operation. Another object is to provide an improved coal cutting apparatus having a fluid operated push rod and stop engageable with an extraneous abutment such as the coal face for controlling feeding movement of the kerf cutting means. A further object is to provide an improved coal mining apparatus having novel arrangements and combinations of parts. Other uses and advantages of the invention will, however, hereinafter more fully appear as the description proceeds.

In the accompanying drawings there is shown for purposes of illustration one form which the invention may assume in practice.

In these drawings:

Fig. 1 is a plan view of a coal mining apparatus constructed in accordance with the illustrative embodiment of the invention.

Fig. 2 is a side elevational view of the mining apparatus shown in Fig. 1.

Fig. 3 is a plan view, similar to Fig. 1, showing parts in a different position.

Fig. 4 is a front elevational view of the improved mining apparatus.

Fig. 5 is a rear elevational view of the improved mining apparatus.

Fig. 6 is an enlarged view in longitudinal vertical section taken substantially on line 6—6 of Fig. 1.

Fig. 7 is an enlarged central, longitudinally extending, vertical sectional view taken substantially on line 7—7 of Fig. 1.

Fig. 8 is an enlarged cross sectional view taken substantially on line 8—8 of Fig. 1.

Fig. 9 is an enlarged cross sectional view taken substantially on line 9—9 of Fig. 1.

Fig. 10 is an enlarged view in longitudinal vertical section taken substantially on line 10—10 of Fig. 1.

Fig. 11 is a diagrammatic view of the coal mining apparatus, showing the kerf cutters in their sumped position prior to the lateral swinging operation.

Fig. 12 is a diagrammatic view of the coal mining apparatus, showing the kerf cutters during the lateral swinging operation while effecting a straight face cut.

Fig. 13 is a diagrammatic view of the coal mining apparatus, showing the kerf cutters at the completion of the lateral swinging operation and prior to the withdrawal operation.

Fig. 14 is a diagrammatic view of the coal mining apparatus, showing the kerf cutters at the completion of the withdrawal cutting operation.

Fig. 15 is a diagrammatic view showing the hydraulic system and control means.

In this illustrative embodiment of the invention there is shown a coal mining apparatus of the track mounted, dual-kerf-cutter type, although it will be evident that various features of

the invention may be incorporated in mining apparatus of various other types.

The coal mining apparatus shown generally comprises a portable base 1 having mounted thereon a horizontal turntable 2 which supports a pair of identic tiltable supports 3, 3 by which dual kerf cutters 4, 4 are respectively carried. The portable base is herein in the form of a truck frame 5 mounted on wheels 6 adapted to travel along a mine trackway 7 laid on the mine floor. The turntable 2 is swivelled at 8 (Fig. 7) on a bearing supported by the truck frame, to turn horizontally relative to the truck frame. Arranged longitudinally of the truck frame, beneath the turntable, is a fluid operated push rod and stop, generally designated 9, engageable with an extraneous abutment, such as the coal face for controlling the feeding movement of the kerf cutters, in the manner to be later explained.

Mounted on the rearward platform 10 of the truck frame is a motor 11 having its power shaft connectible through a clutch controlled plural speed transmission 12 to chain and sprocket connections 13 for driving the truck wheels and to clutch controlled connections 14 for driving a cable reel 15. Wound on the cable reel in use will be a conventional power conductor cable for supplying motive power to the various motors of the apparatus, as will also be later described. At the rear end of the truck frame is a conventional bumper 16 and coupling means 17.

The tiltable supports 3, 3, by which the kerf cutters are carried, each have mounted thereon a motor 18 (Fig. 6) having its power shaft 19 vertically disposed and connectible by a conventional sliding clutch 20 to a tubular shaft 21. The shaft 19 is suitably journaled within the upper part of a housing 22, and the shaft 21 is journaled on bearing sleeves supported by the shaft 19, in the manner shown. Formed on the shaft 21 is a chain sprocket 23 connected by an endless drive chain 24 to a chain sprocket 25 secured to a vertical shaft 26. The shaft 26 is herein arranged with its axis coincident with the pivotal axis of a horizontally swingable cutter support or arm 27, and is journaled at its upper end within bearings supported by this support. Rotatable with and driven by the sprocket 25 is a sprocket 28 connected by an endless drive chain 29 to a sprocket 30 keyed to a vertical shaft 31 likewise journaled in bearings supported by the swingable cutter support or arm 27. The shaft 31 has splined telescopic engagement with a tubular shaft 32 journaled in a vertically adjustable hanger frame 33 by which a kerf cutter is carried. Keyed to the lower end of the shaft 32 is a chain sprocket 34 which engages and drives an endless cutter chain 35 guided for circulation about the margin of an elongated plane cutter bar 36 of a kerf cutter. The cutter bar is rigidly attached at 37 to a bracket 38 integral with the hanger frame. It will thus be seen that when the clutches 20 are connected the cutter chains may be driven by the motors 18, and when the clutches are released the cutter chains may remain idle during running of the motors.

Now referring to the swinging means for the turntable 2, it will be noted that arranged transversely of the truck frame platform rearwardly of the turntable is a pair of single-acting hydraulic cylinders 40, 40 disposed in axial alinement and each containing a reciprocable piston 41 (Fig. 8). The piston rods 42 of the pistons project inwardly toward one another and are secured at their inner adjacent ends to a bracket 43. This bracket supports a vertical stud 44 on which a pair of superimposed guide sheaves 45, 45 are journaled. Attached at one end at 46 to the cylinders 40 and passing around the guide sheaves 45, 45 is a pair of cables 47, 47 having their opposite ends attached at 48 to the opposite sides of the turntable. When liquid under pressure is supplied to one or the other of the hydraulic cylinders 40, the sheaves may be moved to deflect one or the other of the pair of cables 47, thereby to turn the turntable about its swivel axis in one direction or the other, swinging therewith the kerf cutters.

As above mentioned, the supports 3, 3 are tiltable relative to the turntable to effect independent tilting of the kerf cutters in endwise and edgewise directions, thereby to enable the cutters to be properly leveled when the apparatus is operating on an uneven floor. The adjusting means for tilting these supports comprises, for each support, a rearwardly located double-acting hydraulic jack 50 rigidly secured to the turntable near the rearward edge of the latter, as shown in Fig. 6. Contained in this vertical cylinder is a reciprocable piston 51 having its piston rod 52 projecting upwardly and pivotally connected at 53 to a bracket 54. This bracket extends downwardly along one side of the cylinder and provides at 55 a pivotal mounting for the rear end of the tiltable support 3. This pivotal mounting is of the ball and socket type to provide for universality in adjustment and is connected by a bracket 56 to the rear part of the tiltable support. Arranged towards the forward end of the tiltable support near the forward edge of the turntable is a double-acting hydraulic jack comprising a vertical cylinder 60 having at its lower end a universal pivotal connection at 61 with the turntable. Contained in this cylinder is a reciprocable piston 62 having its piston rod 63 projecting upwardly and connected through a conventional universal joint 64 with a bracket 65 secured to the tiltable support 3. The inner adjacent bottoms of the tiltable supports are connected through universal pivotal mountings 66 with the turntable at points spaced inwardly with respect to the pivotal connection 61 for the front jacks. When liquid under pressure is supplied to the rear jacks, the tiltable supports 3 may be tilted on transverse axes about the forward universal pivotal mountings 61, 66, and when liquid under pressure is supplied to the front jacks the supports may be tilted on longitudinal axes about the universal pivotal mountings 55 and 66. Concurrent supply at appropriate rates to the cylinders 50 and 60 will enable tilting on transverse axes extending through the pivot mountings 66. By trapping the liquid within the front and rear jacks, the tiltable supports may be held in their different positions of adjustment.

Again referring to the horizontally swingable supports or arms 27 for the kerf cutters, it will be noted that these supports or arms have depending cylindric bearing portions 69 suitably journaled in bearing sleeves supported by upright tubular bearing supports 70 secured to the bottom portions of the tiltable supports 3. By the provision of these pivotal mountings for the supports or arms 27, the latter may be swung horizontally relative to the supports 3 about vertical axes coincident with the drive shafts 26. The swinging means for each of the supports 27 comprises pairs of hydraulic cylinders 71 and 72. The pair of cylinders 71 extend longitudinally in parallelism along the inner adjacent sides of the supports 3 and respectively contain reciprocable pistons 73

having their piston rods 74 projecting rearwardly and carrying at their rearward ends guide sheaves 75. A cable 76 is attached at its ends at 77 to the forward inner sides of the swingable supports 27 and passes around guide sheaves 78 respectively journaled on the supports. Portions of the cable extend rearwardly from the guide sheaves 78 and pass around the guide sheaves 75, and the intermediate portion of the cable passes around a centrally located guide sheave 79 journaled on a bracket 80 secured to the turntable and projecting upwardly between the cylinders 71, as shown in Fig. 9. Another cable 81 has its ends attached at 82 to the outer front sides of the swingable supports 27 and has portions guided by arcuate guide surfaces 83 on the forward ends of the supports 3. Portions of this cable pass around guide sheaves 84 respectively journaled at the outer sides of the supports 3, and the intermediate portion of the cable passes over guide sheaves 85 journaled on brackets 86 carried by the piston rods 87 of reciprocable pistons 88 respectively contained in the pair of cylinders 72. The sheave brackets 86, on which the sheaves 85 are journaled, are guided for movement along longitudinal guide members 89 secured to the supports 3. Similar guide members are provided for the brackets for the sheaves 75. It is accordingly evident that when liquid under pressure is supplied to certain ones of the pairs of cylinders 71, 72 portions of the cables 76 and 81 are deflected to swing the supports or arms 27 concurrently in opposite directions about their pivots relative to the supports 3, thereby to swing the kerf cutters concurrently outwardly relative to one another. When the others of the pairs of cylinders are operated, the supports are swung to move the kerf cutters concurrently inwardly toward one another. By trapping the liquid within the cylinders the supports may be held in their adjusted position, thereby to hold the kerf cutters against swinging movement about their pivotal axes. To prevent interference between the cables when the tiltable supports 3 are raised at their outer edges, hold-down sheaves 89' (Figs. 1 and 7) may be provided overlying the cable 81 at the portions thereof near the inner edges of the supports 3, 3.

As previously mentioned, the cutter hanger frames 33 are adjustable in a vertical direction relative to the horizontally swingable supports 27, and suitable upright guideways on the supports receive guides on the hanger frames to guide the latter during their adjustment. The adjusting means for the hanger frames each comprises a single-acting hydraulic jack having a vertically disposed reciprocable cylinder 90 secured to the rearward part of the hanger frame and containing a piston 91 having its piston rod 92 projecting upwardly and secured at 93 to a support 27. Secured to the forward part of each support 27 is a single-acting jack having a vertical cylinder 94 containing a reciprocable piston 95 having its piston rod 96 secured at 97 to a bracket 98 rigidly attached to a hanger frame. This bracket projects through a vertical slot 99 in the depending front frame portion of the support, so that the bracket may move up or down with respect to the support during hanger frame adjustment. It will thus be seen that when liquid under pressure is supplied to the proper jack cylinders the cutter hanger frames 33 may be moved either upwardly or downwardly along their guideways relative to the supporting frames 27. By trapping the liquid within these jack cylinders, the hanger frames and so the kerf cutters may be held in adjusted position.

The fluid operated push rod and stop 9 comprises a horizontal, longitudinally disposed hydraulic cylinder 100 secured to the truck frame (Fig. 7) and containing a reciprocable piston 101 having a tubular piston rod 102 projecting forwardly from the front end of the cylinder. Reciprocable within the bore 103 of the piston rod is a piston 104 having a plunger-like piston rod 105 projecting outwardly from the cylinder in a forward direction a substantial distance in advance of the truck. The front end of the piston rod 105 has a front end abutment surface 106 engageable with an extraneous abutment, such as the coal face. The piston rod bore 103 has constant communication with the cylinder bore through an axial passage 107. These cylinders and pistons thus cooperate to provide a double telescopic hydraulic ram which is engageable with the coal face to control the feeding movement of the kerf cutters during certain kerf cutting operations.

Now referring to the hydraulic system for supplying liquid under pressure to the various hydraulic cylinders of the apparatus, it will be noted that arranged at the rear ends of the tiltable supports 3 are liquid tanks 108 containing conventional hydraulic pumps 109 driven by motors 110. These pumps have their intakes 111 submerged in the liquid in the tanks and have their discharge sides connected by conduits 112 to a supply conduit 113 in turn connected to the supply passage of a conventional valve box, generally designated 114. This valve box is preferably mounted on the rear end of the truck frame platform 10 and has its vertical valve bores (not shown) containing conventional rotary control valves 115, 116, 117, 118, 119, 120, 121, 122, 123 and 124 each provided with a suitable control handle. The discharge passage of the valve box is connected by a discharge conduit 125 back to the tanks 108. The valve 115 controls the flow of liquid under pressure to the front jack cylinder 60 for one of the tiltable supports 3, and conduits 126 and 127 connect the opposite ends of the cylinder 60 with the valve receiving bore. The valve 116 controls the flow of liquid under pressure to the opposite ends of the rear jack cylinder 50 for this same support, and conduits 128 and 129 connect the cylinder ends with the valve receiving bore. The valve 117 controls the flow of liquid under pressure to the turntable rotating cylinders 40, and conduits 130 and 131 connect the remote ends of the cylinders with the valve receiving bore. The valve 118 controls the flow of liquid under pressure to the hydraulic push and stop ram 9, and a conduit 132 connects the valve receiving bore with the rear end of the cylinder 100. The valve 119 controls the flow of liquid under pressure to the swinging cylinders 72 for the cutter supports 27, while the valve 120 controls the flow of liquid under pressure to the swinging cylinders 71 for these cutter supports, and the valve receiving bores are respectively connected through conduits 133 and 134 to the cylinders. The valve 121 controls the flow of liquid under pressure to the rear jack cylinder 50 for the other tiltable support 3, and has its valve receiving bore connected through conduits 135 and 136 to the opposite ends of the cylinder. The valve 122 controls the flow of liquid under pressure to the front jack cylinder 60 for this same support and has its valve receiving bore

connected through conduits 137 and 138 to the opposite ends of the jack cylinder. The valves 123 and 124 control the flow of liquid under pressure to the jack cylinders 90 and 94 for the adjustable cutter hanger frames 33 and have their valve receiving bores respectively connected through conduits 139 and 140 to the opposite ends of the cylinders 90 and 94 for one cutter hanger frame and through conduits 141, 142 to the cylinders for the other cutter hanger frame. If desired, stop valves may be arranged in any branch lines to enable some independence of control of fluid through the different branches. The valve devices are adapted to control supply and venting of liquid, and to trap liquid when desired.

The truck propelling motor 11 is provided with a conventional control box 144 preferably arranged on the truck frame platform rearwardly of the turntable, while the motors 16 and 110 have similar control boxes 145, 145 preferably arranged at the rear end of the tiltable supports 3, 3, respectively, and the usual power conductor cable (not shown) on the reel 15 is suitably connected to these control boxes. The apparatus may be equipped with indicators, such as conventional indicator dials and pointers, to show when the kerf cutters are parallel and to give their angular distance apart so that the right width of cut may be easily determined by the operator. Also, a conventional hand brake 146 may be provided for braking the truck wheels, and a hand brake lever 147 is conveniently located near the operator's seat 148 on the truck frame platform. The valve box 114 and the control box 144 are also conveniently located near the operator's seat.

The general mode of operation of the improved coal mining apparatus is as follows. The apparatus may be propelled rapidly about the mine under the propulsion of the motor 11 through the high speed truck wheel driving means, and as the apparatus travels through the sharply curved passages of a mine the dual kerf cutters 4, 4 may be swung in unison horizontally to one side or the other of the truck simply by rotating the turntable 2, thereby to facilitate passage of the apparatus through the curved mine passages. When the working face of a coal seam is reached, the dual kerf cutters 4, 4 may be disposed in parallelism lengthwise of the truck frame with their outer tip ends in adjacency to the coal face. The cutter driving motors 18, 18 are then started, and when the cutter drive clutches 20 are connected the cutter chains are rapidly circulated in opposite directions about the margin of the cutter bars. The apparatus is then propelled forwardly along the mine trackway at a relatively low cutting speed to effect sumping of the kerf cutters in an endwise direction into the coal seam. The abutment surface of the push rod of the hydraulic ram 9 may at this time be engaged with the coal face. Due to the arrangement of the kerf cutters in close proximity and the direction of circulation of the cutter chains, the cutting action of the cutters on the coal during swinging of the cutters serves to aid the truck propelling means in the forward movement of the apparatus toward the coal face, thereby, to a substantial extent, to relieve the trackway of strains during the cutting operation. By so utilizing the cutters as a supplemental feed for the apparatus it is possible under most conditions to do away with auxiliary feed devices such as feed ropes, jacks or the like. The hydraulic ram then engaging the coal face may serve as a stop to control the depth of the sumping cut by its engagement with the coal face. When the sumping cut is completed and the kerf cutters have assumed the position shown in Fig. 11, truck wheel propulsion is interrupted and the hand brake is set. The hydraulic cylinders 72 of the cutter swinging means may then be operated to effect lateral swinging movement of the kerf cutters concurrently outwardly away from one another, as shown in Fig. 12. During the lateral swinging operation the hydraulic ram 9 which abuts the coal face may be operated to act in opposition to the propelling means to control the movement of the apparatus forwardly along the trackway as the kerf cutters swing laterally, so that a straight face may be cut in the coal face, in an obvious manner and, under those circumstances, the brake is, of course, released. When the lateral swinging cut has been completed and the kerf cutters have assumed the position shown in Fig. 13, operation of the swinging cylinders 72 is interrupted and the liquid is trapped in these cylinders to hold the kerf cutters in position. The hand brake, if applied, is then released and the low speed truck wheel propelling means is operated to effect rearward movement of the apparatus along the trackway to withdraw the kerf cutters from the coal, thereby to complete the cut. Instead of using the truck propelling means to move the apparatus rearwardly along the trackway at a low cutting speed during the withdrawal operation, rearward movement of the apparatus may be effected by the hydraulic ram 9 under hydraulic control. When the kerf cutters are in their withdrawn position shown in Fig. 14, the operator may effect operation of the cutter swinging cylinders 71 to swing the kerf cutters inwardly toward one another until they again assume the parallel position shown in Fig. 11. During the kerf cutting operation the cutter supports 3, 3 may be tilted with respect to the horizontal about transverse and longitudinal axes to effect endwise and edgewise tilting movements of the kerf cutters, thereby to enable the latter to be leveled up when the apparatus is operating on an uneven floor simply by operating the hydraulic jacks 50 and 60. The kerf cutters may be adjusted into different elevated positions with respect to the mine floor by operating the hydraulic jacks 90 and 94 to raise or lower the cutter hanger frames 33 along their guideways relative to the swingable supports 27. If desired, sumping of the kerf cutters may be effected by using the high speed truck propelling means under the control of the hydraulic ram 9 by inserting a jack or post, or some similar extension, between the plunger 105 and the coal face, and after the cutters have been sumped into the coal, movement of the apparatus forwardly along the trackway during straight face cutting may, under certain conditions, be effected solely by the action of the cutters on the coal during lateral swinging of the cutters. Other modes of use and advantages of the improved coal mining apparatus will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A mining apparatus movable toward and from the work comprising, in combination, propelling means, coal mining devices, means for operating said propelling means and said mining devices, and a fluid actuated stop and push rod engageable with the work and acting in opposition to said propelling means for controlling movement of the apparatus by said propelling means with respect to the work.

2. A mining apparatus movable toward and from the working face of a coal seam comprising, in combination, propelling means, coal mining devices, means for operating said propelling means and said mining devices, and fluid actuated means engageable with the coal face and acting in opposition to said propelling means for controlling movement of the apparatus by said propelling means with respect to the coal face.

3. A mining apparatus comprising, in combination, a portable base, a pair of cooperating, oppositely acting cutting devices pivotally mounted on said base to swing horizontally relative thereto, means for actuating said cutting devices, means for swinging said cutting devices, means for moving said base relative to the working face to effect feed of said cutting devices, and means engageable with an extraneous abutment and controllable at will for controlling the movement of the apparatus by said base-moving means with respect to the working face, said abutment-engaging means acting in opposition to said base-moving means.

4. A mining apparatus comprising, in combination, a portable base, a pair of cooperating, oppositely acting cutting devices pivotally mounted on said base to swing horizontally relative thereto, means for actuating said cutting devices, means for swinging said cutting devices, said cutting devices being so constructed and arranged as to effect movement of the apparatus toward the work by the cutting action of the cutting devices on the coal during swinging of said devices, and means engageable with an extraneous abutment and controllable at will for controlling the movement of the apparatus by said cutting devices toward the working face, said abutment-engaging means acting in opposition to movement of the apparatus toward the working face.

5. In a mining apparatus, the combination comprising a portable base, a turntable on said base, a pair of tiltable supports mounted on said turntable at the opposite sides thereof, and cooperating kerf cutters carried by said tiltable supports respectively.

6. In a mining apparatus, the combination comprising a portable base movable toward and from the working face of a coal seam, cutting devices mounted on said base and having cutters so constructed and arranged as to effect movement of the apparatus toward the working face by the cutting action of the cutters on the coal, and means engageable with the working face and controllable at will for controlling such movement of the apparatus toward the working face.

7. In a mining apparatus, the combination comprising a portable base movable toward and from the working face of a coal seam, cutting devices mounted on said base and having cutters so constructed and arranged as to effect movement of the apparatus toward the working face by the cutting action of the cutters on the coal, and means engageable with the working face and controllable at will for controlling such movement of the apparatus toward the working face and for effecting movement of the apparatus away from the working face.

8. In a mining apparatus, the combination comprising a portable base movable toward and from the working face of a coal seam, cutting devices mounted on said base and having cutters so constructed and arranged as to effect movement of the apparatus toward the working face by the cutting action of the cutters on the coal, and extensible fluid actuated means engageable with the working face and controllable at will for controlling such movement of the apparatus toward the working face.

9. In a mining apparatus, the combination comprising a portable base, a turntable on said base, supports mounted on said turntable to tilt in a plurality of directions with respect thereto, means for tilting said supports and for holding them in their different tilted positions, and kerf cutters, one carried by each of said tiltable supports.

10. In a mining apparatus, the combination comprising a portable base, a pair of cooperating, independently operable cutting devices on said base, means for independently operating said cutting devices including separate motor operated connections for each cutting device, and means for moving said cutting devices toward and from each other and independently relative to each other, said cutting devices being movable concurrently toward each other into substantial parallelism so that the cuts made thereby are substantially joined at a vertical plane lying in the longitudinal center of the apparatus.

11. In a mining apparatus, the combination comprising a portable base, a turntable on said base, tiltable supports mounted on said turntable, a pair of cooperating cutting devices carried by said tiltable supports respectively, and means for separately adjusting said cutting devices so that one of said cutting devices may be adjusted without disturbing the other one.

12. In a mining apparatus, the combination comprising a portable base, supports independently tiltably mounted in side by side relation at substantially the same elevation at the opposite sides of said base, and cooperating kerf cutters carried by said tiltable supports respectively and tiltable independently therewith.

13. In a mining apparatus, the combination comprising a portable base, a turntable on said base, supports tiltably mounted on said turntable at the opposite sides thereof, arms pivotally mounted on said supports respectively to swing relative thereto, and cooperating kerf cutters carried by said arms respectively.

14. In a mining apparatus, the combination comprising a portable base, cutting devices carried by said base and movable with the latter toward and from the work, and means mounted on said base and having abutting engagement with the face of the work for controlling movement of said cutting devices toward and from the work during the cutting operation, said movement-controlling-means acting in opposition to the movement of the base toward the work.

15. In a mining apparatus, the combination comprising a portable base, a pair of cooperating cutting devices pivotally mounted on said base to swing in common planes toward and from one another, and means for independently tilting said cutting devices to move the latter into relatively inclined planes.

16. In a mining apparatus, the combination comprising a portable base, a pair of kerf cutters pivotally mounted on said base to swing toward and from one another in common planes about parallel axes, and means for independently tilting said kerf cutters relatively to move the same out of said common planes.

17. In a mining apparatus, coal mining devices, propelling means for effecting movement for said mining devices with respect to the work, means for operating said mining devices and said propelling means, and means extending forwardly lengthwise of the apparatus and engageable with an extraneous abutment in advance of the apparatus, said abutment engaging means acting in opposition to said propelling means for controlling movement of said mining devices with respect to the work.

18. In a mining apparatus, coal mining devices, propelling means for effecting movement for said mining devices with respect to the work, means for operating said mining devices and said propelling means, and fluid operated reciprocable means extending forwardly lengthwise of the apparatus and engageable with an extraneous abutment in advance of the apparatus, said fluid operated means acting in opposition to said propelling means for controlling movement of said mining devices with respect to the work.

19. In a mining apparatus, the combination comprising a portable base, a support mounted on said base to rotate about an upright axis, a pair of adjustable supports mounted on said rotatable support at the opposite sides thereof for adjustment relative thereto and projecting horizontally beyond the forward side of said rotatable support, and cooperating kerf cutters carried by said adjustable supports respectively in advance of said rotatable support and adjustable with said adjustable supports into different cutting positions.

20. In a mining apparatus, the combination comprising a portable base, a support mounted on said base to rotate relative thereto about an upright axis, a pair of supports mounted at the opposite sides of said rotatable support for adjustment in a plurality of angularly related directions with respect thereto, and cooperating kerf cutters carried by said adjustable supports respectively and adjustable therewith into different cutting positions.

21. In a mining apparatus, the combination comprising a portable base, a support mounted on said base to rotate about an upright axis, supports adjustably mounted on said rotatable support at the opposite sides of the latter, arms pivotally mounted on said adjustable supports respectively to swing relative thereto and overlying said rotatable support, and cooperating kerf cutters carried by said arms respectively in advance of said rotatable support.

22. In a mining apparatus, the combination comprising a portable base, a support mounted on said base to rotate about an upright axis, supports adjustably mounted on said rotatable support at the opposite sides of the latter, arms pivotally mounted on said adjustable supports respectively to swing relative thereto and overlying said rotatable support, cooperating kerf cutters carried by said arms respectively in advance of said rotatable support, and means for swinging said arms about their pivots relative to said adjustable supports to move said kerf cutters toward and from one another.

23. In a mining apparatus, the combination comprising a portable base, supports mounted in side by side relation at the opposite sides of said base, said supports being independently tiltable relative to said base, and cooperating kerf cutters carried by said tiltable supports respectively and independently tiltable therewith into different angularly related cutting positions.

24. In a mining apparatus, the combination comprising a portable base, supports mounted in side by side relation on said base to tilt in a plurality of angularly related directions with respect thereto, means for tilting said supports and holding them in their different tilted positions, and kerf cutters, one carried by each of said tiltable supports and tiltable therewith into different angularly related cutting positions.

25. A mining apparatus movable toward and from a working face of a coal seam comprising, in combination, propelling means, coal mining devices, means for operating said propelling means and said mining devices, and a hydraulic ram engageable with the working face and acting in opposition to said propelling means for controlling movement of the apparatus by said propelling means toward the working face.

26. A mining apparatus movable toward and from a working face of a coal seam comprising, in combination, propelling means, coal mining devices, means for operating said propelling means and said mining devices, a hydraulic ram engageable with the working face and acting in opposition to said propelling means for controlling movement of the apparatus by said propelling means toward the working face, said ram being operable independently of said propelling means for moving the apparatus away from the working face.

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